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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,492	04/23/2006	Seyed Mahdi Tavakoli	62859.0001	1490

24629 7590 12/17/2009
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EXAMINER

LIPITZ, JEFFREY BRIAN

ART UNIT	PAPER NUMBER
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3769

MAIL DATE	DELIVERY MODE
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12/17/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/595,492	Applicant(s) TAVAKOLI ET AL.	
	Examiner JEFFREY B. LIPITZ	Art Unit 3769	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,6-8 and 13-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,6-8 and 13-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

The drawings are objected to because Figure 8c has a background which makes it difficult to make out lines. In particular element 78 is indiscernible. Figure 15 has elements that are not labeled with indicia indicative of their function. In addition, the drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the force measurement elements or sensors must be shown or the features canceled from the claims. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

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the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 8 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form. This claim does not provide an additional element to the system or modify an existing element of the system. Therefore, this claim does not further limit the scope of the claim from which it depends.

Claims 18, 19 and 20 is objected to under 37 CFR 1.75(c), as being of improper dependent form. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form. These claims should begin with the element(s) to be modified (i.e....the strain gauges) and then specify the modification. The functional language can appear after the modification. For instance, claim 18 should read "the system comprises strain gauges located on a link between said endoscopic instrument and said slave end, wherein the compression/tensional forces on said free end element are measured".

Claim 17 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form. This claim does not provide an additional

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element to the system or modify an existing element of the system. Therefore, this claim does not further limit the scope of the claim from which it depends.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 18-21, 23, 27, 29, 37 and 40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 18, 19, 20 and 21, it appears that claim 18 should depend from claim 17, but currently depends from dependent claim 37. Examiner will apply prior art as if it depends from claim 17, however Applicant must clarify and amend the claim to indicate the appropriate claim from which it depends.

Claim 19 recites the limitation "said inner tube". There is insufficient antecedent basis for this limitation in the claim.

Claims 19 and 29 recite that the strain gauges are located remotely from the free end element. It is unclear how this limitation further limits the scope of the invention. What does Applicant define as remote? Furthermore, is there any rationale for providing a remote gauge?

Claim 20 recites the limitations "said middle tube" and "said torsional movements". There is insufficient antecedent basis for either of these limitations in the claim.

Claim 21 recites the limitation "said haptic device". There is insufficient antecedent basis for this limitation in the claim.

Claim 23 recites the limitation "said part of said slave end". There is insufficient antecedent basis for this limitation in the claim.

Claims 27 and 37 recite an inner end of the inner tube. This phrase is unclear because it could mean the inside of the inner tube at an end or simply an end of the inner tube, where inner is used to define the tube.

Claim 40 provides for the use of motors and encoders, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 6-8, 14-17, 22, 24, 26, 32-34 and 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Shahoian et al. (20010000663), hereinafter Shahoian.

Regarding claims 1, 2, 6, 7, 32 and 33, Shahoian teaches a robotic system or haptic feedback control device or manipulator system (10; Paragraph [0011]; Figure 1)

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comprising a master end effector (12), a slave unit or end (14), and an electronic interface or computer (16; Paragraph [0064]; Figures 1 and 20),) that sends signals from the master (12) which are used to control the slave (14; Paragraph [0039]) and sends signals from the slave to provide haptic feedback to the master (Paragraph [0042]). The master (12) has six degrees of freedom (DF1-6; Paragraph [0035]; Figure 1), and the slave (14) has force measurement elements or sensors (344; Paragraph [0042], [0048] and [0109]; Figures 5b and 12) that indirectly detect force via acceleration sensors or potentiometers for each of the degrees of freedom (Abstract and Paragraph [0109]). The master end (12) and slave ends (14) can receive and send those forces (Paragraph [0088] and [0090]), are communicated to one another via the interface (16; Figure 12). The purpose of the providing the system is to interface with a simulation program (Paragraphs [0003], [0014], [0084] and [0113]), which is representative of the slave end.

Regarding claim 8, Shahoian teaches that the interface provides signals in both directions (Paragraphs [0005]).

Regarding claim 14, Shahoian teaches that the master end or grip can be manipulated in space in a fashion that the operator wishes the instrument to move and rotate or in other words that the master end is constructed to emulate the movements to be carried out at the slave end (Paragraph [0006]). The remaining limitations are substantially the same as claims 1 and 2, rejected supra.

Regarding claim 15, this claim recites substantially similar limitations to those of claims 1 and 7, rejected supra.

Regarding claims 16 and 17, Shahoian teaches that the physical movements can be yaw or rotation about the base member (50; Paragraph [0040]; Figure 1), pitch or rotation about the hinge that connects base member (50) to linkage member (52; Paragraph [0041]), roll or rotation about the longitudinal axis of linkage (56), movement or opening and closing of the gripper or free end element (58), and insertion and removal of the slave end by rotating the linkage member (52) relative to the other linkage member (54). Since the device or system (10) is capable of insertion, it is therefore capable of insertion into a patient. The use of the device as a medical device is merely the intended use of the invention, and is accorded negligible patentable weight.

Regarding claim 22, Applicant does not explicitly define or illustrate a laproscopic member, as claimed. Therefore, Examiner interprets the gripper (58) or free end element as being capable of gripping tissue during surgery. The remaining limitations are substantially similar to those of claims 1 and 7, rejected supra.

Regarding claims 24, 26, and 34, these claims recite substantially similar limitations to those of claims 18 and 22, rejected supra.

Regarding claims 38-39, Shahoian teaches providing and moving the device described in the rejection of claims 1, 7, 8 and 10, rejected supra.

Regarding claim 40, Shahoian teaches using actuators or motors (102; Figures 3 and 4) and encoders that are inherent to sense “high frequency signals” provided to cause force feedback at the master end (Paragraphs [0015], [0038] and [0054]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shahoian.

Regarding claim 23, Shahoian does NOT teach the dimensions of the slave end. However, the intended use of the device is as a minimally invasive surgical device, as discussed in the rejection of claim 17, supra. Insofar, it would have been obvious to one of ordinary skill in the art to make part of the slave end as small as possible, since minimally invasive surgeries requires tools that will cause minimal interference of tissues and organs. A maximum diameter of 10 mm is arbitrary and thus is an obvious matter of design choice.

Claims 19, 20, 25, 27-30, 35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shahoian in view of Haber et al. (5275614), hereinafter Haber.

Regarding claims 25 and 35, Shahoian does NOT teach three concentric tubes that are capable of axial movement to effect a change in the position of the free end element. Attention, however, is directed to Haber who teaches an axially extendable endoscopic surgical instrument (Title and Abstract). Haber teaches barrel or outer tube (404; Figure 11), hollow spindle or middle tube (406) and draw tube or inner tube (411; Column 8, Lines 1-57), which are concentrically aligned. The middle tube (406) extends beyond the distal end (407) of the outer tube (404; Column 9), and is secured to the

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base or clamp nut (437) of the free end element or jaws (425 and 426) attached to their distal end. Axial movement or elongation of the inner tube (411) is connected to a movable portion or second draw bar (433) of the free end element (Column 6, Lines 56-69; Column 8, Lines 58-69; Figures 9a and 11). It would have been obvious to include the tubular configuration of Haber with the invention of Shahoian, because it allows for independent control over the opening and closing of the gripper relative to the overall positioning of the gripper relative to its environment (Haber: Summary of the Invention).

Regarding claims 27 and 37, Shahoian and Haber do NOT teach a load cell is mounted between an inner end of the inner tube and a motor to measure forces of the free end element. Again Applicant does not provide any reasoning for positioning the load cell or force measurement element at this particular location. It would have been obvious to position the load cell between the motor and an inner end of the inner tube because one or the tubes' ends is at the motor and the other is at the free end element. Therefore, the load cell must be placed between the two in order to measure forces imparted to the inner tube. In addition, it would have been obvious to place the load cell between these two elements because inside the inner tube the load cell is protected from the working environment.

Regarding claim 18, Shahoian teaches sensor (126) coupled to linkage (122) that senses the positions of the finger pads (78). Sensor (126) can be a potentiometer, a capacitive sensor, an optical encoder or a Hall-effect sensor all of which can be calibrated to read out strain (Paragraph [0062]). The potentiometer in particular is structurally analogous to a strain gauge, since a linear or axial potentiometer contains a

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rod whose length is changed according to an applied force. Strain is defined as the change in length over the resting length.

Regarding claims 19 and 29, Shahoian and Haber do NOT teach that the strain gauges are located on opposite sides of the inner tube remote from the free end element as claimed. However, Applicant provides no rationale for this limitation. Therefore, Examiner interprets the placement of the strain gauges as not critical to the practice of the invention. It would have been an obvious design choice to place the strain gauges on opposite sides of the inner tube because it would protect the gauges from the working environment. Furthermore, the use of two strain gauges on opposite sides would allow redundant measurements in the working range of both gauges and would also allow measurement over a greater range of lateral forces. For instance when the free end element moves a lateral distance in which one of the two gauges is fully compressed; the other gauge may still be extended within its working range. It would have been obvious to make the gauges remote from the free end element, because slight movements of the free end element would then result in large measurements. In other words, the greater the distance from the free end element the more the movements are amplified, since the force is working through a moment arm.

Regarding claim 21, Shahoian teaches that the link or linkage mechanism (122; Figure 5b) between the instrument or gripper (58) with pads (78a and 78b) and haptic device or actuator (124) contains two arcuate arms or link members (134a and 134b) that are pivotally mounted relative to one another at their coupling point (Paragraph [0068]). The brace, which at one end is coupled to the coupling point between the two

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arms and therefore extending from the lower end of one of them, is coupled at the other end to the sensor (126). The sensor can be a strain gauge as discussed in the rejection of claim 18, supra.

Regarding claim 28, Shahoian teaches sensor (126) coupled to linkage (122) that senses the positions of the finger pads (78). Sensor (126) can be a potentiometer, a capacitive sensor, an optical encoder or a Hall-effect sensor all of which can be calibrated to read out strain (Paragraph [0062]). The potentiometer in particular is structurally analogous to a strain gauge, since a linear or axial potentiometer contains a rod whose length is changed according to an applied force. Strain is defined as the change in length over the resting length.

Regarding claims 31, this claim recites substantially similar limitations to those of claim 21, rejected supra.

Regarding claims 20 and 30, Shahoian and Haber do NOT teach a strain gauge is on the middle tube remote from the free end element. However, again Applicant provides no rationale for placing a strain gauge in that particular position. Therefore, Examiner interprets this limitation as not critically essential to the practice of the invention. It would have been obvious to place a strain gauge on the middle tube because it would protect the gauges from the working environment. It would have been obvious to make the gauges remote from the free end element, because slight movements of the free end element would then result in large measurements. In other words, the greater the distance from the free end element the more the movements are amplified, since the force is working through a moment arm.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shahoian as applied to claim 1 above, and further in view of Hogan et al. (5794621), hereinafter Hogan.

Regarding claim 13, Shahoian teaches that the master end or grip can be manipulated in space in a fashion that the operator wishes the instrument to move and rotate or in other words that the master end is constructed to emulate the movements to be carried out at the slave end (Paragraph [0006]). The gripper (58), which is part of the slave end (Figure 1), can be rotated or imparted a roll in the manner illustrated by arrow (57). The roller (80; Figure 2) is used to provide rotation to the wrist of gripper (58; Paragraphs [0050] and [0051]) and the slave end contains a sensor (126) or force measurement element for providing rotation information of the slave end linkage (122; Figure 5b) to the gripper control (36; Paragraph [0062]-[0063], Figures 1 and 2), which is part of the master end (12). Attention is directed to Hogan who teaches a robotic device with an end effector or slave end that contains position and force sensors (Abstract). Hogan teaches force sensor arrangements (Figures 9A and 9B) that comprise a disk (166) coupled to a cable or a pulley, which in this instance is inherently made of pre-tensioned cables or wires (Column 15, Lines 1-19). Although Hogan does NOT discuss the positions of the pulley or cable, it would have been obvious to attach a pulley to the circumference of the disk because each movement of the disk will exert a greater force on the pulley, which will enhance the signal produced from rotating the disk. Furthermore, it would have been obvious to wrap the two ends of the pulley's

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cable around the disk and pin them to one location because doing so provides a redundant absolute measurement of rotation.

Regarding claim 36, this claim recites substantially similar limitations to those of claim 26, rejected supra.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Alexander (20040045561) teaches an interface device and method for medical procedure stimulation systems. Anderson (20050021018) teaches a robotic surgical tool with an ultrasound cutting instrument. Bevirt (20040183777) teaches a method and apparatus for providing an interface mechanism for a computer simulation. Okamoto (5501114) teaches a three-dimensional free motion apparatus.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JEFFREY B. LIPITZ whose telephone number is (571)270-5612. The examiner can normally be reached on Monday to Thursday, 10 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry M. Johnson III can be reached on (571)272-4768. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JEFFREY B LIPITZ/
Examiner, Art Unit 3769

/Henry M. Johnson, III/
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